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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,605	06/23/2003	Gervase Maxwell Christie	D-21357	9584
27182	7590	02/02/2006	EXAMINER	
PRAXAIR, INC. LAW DEPARTMENT - M1 557 39 OLD RIDGEBURY ROAD DANBURY, CT 06810-5113				ALEJANDRO, RAYMOND
ART UNIT		PAPER NUMBER		
		1745		

DATE MAILED: 02/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/600,605	CHRISTIE ET AL.
	Examiner Raymond Alejandro	Art Unit 1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 29 December 2005.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-10 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-10 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 23 June 2003 is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Response to Amendment***

This office action is responsive to the amendment filed on 12/29/05. The applicant has overcome the objection, the 35 USC 112 rejection and the 35 USC 102 rejection over the JP'470 publication. Refer to the abovementioned amendment for substance of applicant's rebuttal arguments and remarks. However, the present claims are finally rejected as the ground of rejection over another cited reference is herein maintained for the reasons of record.

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5 and 7-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Shabana et al 2004/0018632.

The present claims are directed to a hydrogen storage system wherein the disclosed inventive concept comprises the specific main and auxiliary hydrogen storage system.

#### **As to claims 1 and 7:**

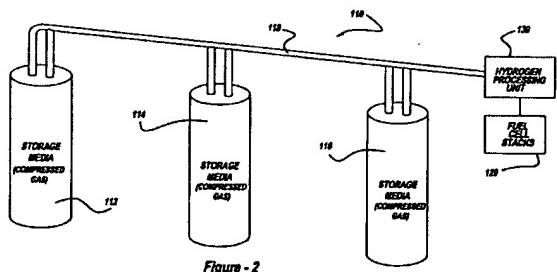
Shabana et al disclose a hydrogen processing unit for a cell storage systems (TITLE) wherein the hydrogen processing unit is provided for attachment between a fuel cell stack (or

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stacks) and a hydrogen storage media (a plurality of hydrogen storage media) (ABSTRACT).

The hydrogen storage includes a hydrogen pressure regulator and other ancillary equipment to enable selective attachment of hydrogen storage media in different forms including compressed gas (ABSTRACT). The fuel cell is a polymer electrolyte/proton exchange membrane fuel cell (SECTION 0014)

Shabana et al depict in **FIGURE 2** below a fuel cell system including three compressed gas hydrogen storage tanks 112, 114, 116 connected to a common manifold 118 for delivery to a hydrogen processing unit 130 for delivering hydrogen at the desired pressure, temperature, humidity and purity to the fuel cell stacks 120 (SECTION 0025). *Thus, Shabana et al at once envisage a flow control network to control the hydrogen flow distribution.*



**Figure 1** below also illustrate the fuel cell system incorporating a hydrogen processing unit which is selectively connectable to a variety of different hydrogen storage media 40, 42, 46, 50 and 52 and to a hydrogen pressure regulator 36 (*←emphasis added*) (SECTION 0012).

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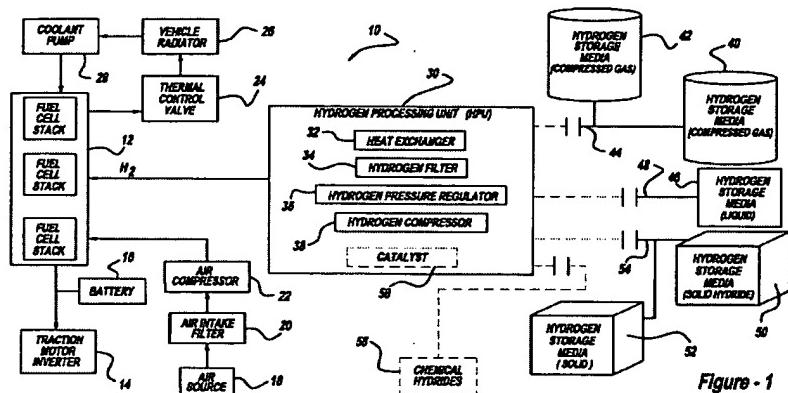


Figure - 1

1<sup>st</sup> Examiner's note: the specific preamble reciting "for supplying hydrogen to a fuel cell employing a polymer membrane, the fuel cell consuming part of the hydrogen to power a load in accordance with a predetermined electrical power requirement and a further part of the hydrogen to operate on a scheduled basis when not powering the load to maintain the polymer membrane in a hydrated condition" refers to intended use. That is, the claim is directed to "a hydrogen storage system" per se and the aforementioned preamble phrase is only a statement of ultimate intended utility.

With respect to claims 2 and 8:

The use of a pressure regulator/throttle valve is taught (SECTION 0006, 0018).

Concerning claim 3:

As illustrated in Figure 2 above, the hydrogen processing unit of Shabana et al includes 3 storage media for compressed hydrogen gas (See FIGURE 2). In addition to that, as evident from Figure 1 above, the fuel cell system 10 includes a variety of different hydrogen storage media 40, 42, 46, 50 and 52 (See Figure 1); and Shabana et al disclose that the originally installed hydrogen storage media may be removed therefrom and replaced by a different type of hydrogen storage media which includes hydrogen stored in a different state such as gas without

modification of the hydrogen processing unit (SECTION 0024). Therefore, Shabana et al envisions that hydrogen storage media 46, 50 and 52 can be replaced by compressed hydrogen gas tanks, accordingly, Shabana et al at once envisage the use of 5 compressed hydrogen gas tanks as the hydrogen storage media which are either connected to the common manifold or connected to uncommon manifolds.

In reference to claims 4-5 and 8:

Shabana et al depict in **FIGURE 2** below a fuel cell system including three compressed gas hydrogen storage tanks 112, 114, 116 connected to a common manifold 118 for delivery to a hydrogen processing unit 130 for delivering hydrogen at the desired pressure, temperature, humidity and purity to the fuel cell stacks 120 (SECTION 0025). Thus, Shabana et al at once envisage a flow control network to control the hydrogen flow distribution.

In addition, Shabana et al disclose that the originally installed hydrogen storage media may be removed therefrom and replaced by a different type of hydrogen storage media which includes hydrogen stored in a different state such as gas without modification of the hydrogen processing unit (SECTION 0024). Shabana et al disclose the hydrogen pressure regulator drops the pressure to a predetermined a desired stack pressure when the hydrogen storage media is compressed gas (SECTION 0018), and/or liquid hydrogen (SECTION 0019), and/or hydrogen in solid form (SECTION 0020). Therefore, Shabana et al envisions that hydrogen storage media 46, 50 and 52 can be replaced by compressed hydrogen gas tanks, accordingly, Shabana et al at once envisage the use of 5 compressed hydrogen gas tanks as the hydrogen storage media which are either connected to the common manifold or connected to uncommon manifolds. Hence,

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Shabana et al discloses the pressure harmonization of each hydrogen storage media (gas, liquid or solid) when they are combined together.

As for claims 9-10:

Shabana et al disclose that the originally installed hydrogen storage media may be removed therefrom and replaced by a different type of hydrogen storage media which includes hydrogen stored in a different state such as gas without modification of the hydrogen processing unit (SECTION 0024). *Thus, periodical removal and replacement of the hydrogen storage media is contemplated.*

Thus, the claims are anticipated.

#### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

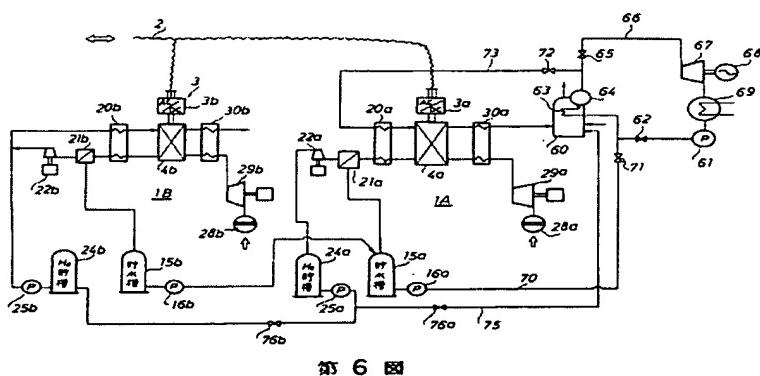
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5. Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shabana et al 2004/0018632 as applied to claims 1 and 7 above, and further in view of the Japanese publication JP 04-115470 (herein called “*the JP’470 publication*”).

Shabana et al are applied, argued and incorporated herein for the reasons above. However, Shabana et al does not expressly disclose the specific pressure regulators/check valve arrangement. (*This is done to further address applicant’s specific arguments that Shabana et al does not teach what claims 2 and 8 specifically call for*).

The JP’470 publication discloses a fuel cell power generator comprising hydrogen storage tanks and a common manifold 10 to distribute hydrogen therefrom (ABSTRACT).

**Figure 6** below illustrates the fuel cell comprising the hydrogen distribution system including tanks 24a and 24b (that is, two different hydrogen storage sites, ←emphasis added); valves 76a, 76b and pressure regulator/indicator 25a, 25b. The JP’470 publication mentions that hydrogen is fed to the storage tank through the manifold 10, and thereafter, said hydrogen is re-introduced into the fuel cell (ABSTRACT). *Thus, hydrogen is periodically renewed so that sufficient hydrogen is available for operation of fuel cells.*



*valves and pressure regulator/indicator, it can be established that it has a flow control network allowing distribution of hydrogen gas therethrough.*

Figure 6 above illustrates the fuel cell comprising the hydrogen distribution system including tanks 24a and 24b; valves 76a, 76b and pressure regulator/indicator 25a, 25b

In view of the abovementioned teachings, it would have been obvious to combine the specific pressure regulators/check valve arrangement of the JP'470 publication with the fuel cell system of Shabana et al because it is well-known in the art that valves and pressure regulators/indicators, when incorporated in a fluid distribution system, allow to effectively regulate, control, manage and distribute fluids. In particular, the JP'470 publication suggests to those skilled in the art that power is efficiently generated and preserved by maintaining an effective supply of hydrogen. Thus, the JP'470 publication readily envisions the benefits of having a regulated fluid distribution system including valves and pressure regulators/indicators.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over: a) Shabana et al 2004/0018632 and/or b) Shabana et al 2004/0018632 further in view of the Japanese publication JP 04-115470 (herein called "*the JP'470 publication*") as applied to claim 2 above, and further in view of McAlister 6756140.

Shabana et al and/or Shabana et al-the JP'470 publication are applied, argued and incorporated herein for the reasons above. Nevertheless, the preceding prior art reference does not expressly disclose the specific carbon-fiber wrapped hydrogen cylinder/tank.

McAlister discloses energy conversion devices (TITLE) using a fiber reinforced composite cylindrical tank with walls comprising densely wrapped carbon fiber (COL 9, line 55-65 and COL 10, line 14-18).

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to use the specific carbon-fiber wrapped hydrogen cylinder/tank of McAlister in the hydrogen processing unit of Shabana et al and/or Shabana et al-the JP'470 publication as McAlister teaches that such specific cylinder tank is capable of effectively sustaining high pressures as required for storing hydrogen as well as it is useful in mobile applications.

#### ***Response to Arguments***

7. Applicant's arguments filed on 12/29/05 have been fully considered but they are not persuasive.
8. Applicant's arguments with respect to claims 2 and 8 have been considered but are also moot in view of the new ground(s) of rejection.
9. Having overcome the prior art rejection over the JP'470 publication, the main contention of applicant's arguments is reduced to the assertion that in the remaining applied reference (Shabana et al) "*Hydrogen would be drawn simultaneously from all three storage tanks and not just one of the storage tanks for maintenance purposes as recited in claim 1*".

First of all, applicant's arguments are confusing and ambivalent because at page 7, lines 17-19 of the amendment of 12/29/05 it has been stated that "*Shabana et al. discloses a hydrogen processing unit 30 which is configured to selectively receive hydrogen gas either a compressed*

*gas source, a liquid hydrogen source or a solid source, but not all at once*”. Then, on page 8, lines 8-10 in the 12/29/05 amendment, applicant has just argued the opposite: “*Hydrogen would be drawn simultaneously from all three storage tanks and not just one of the storage tanks for maintenance purposes as recited in claim 1*”. Thus, applicant’s position is unclear.

Thus, assuming arguendo that applicant’s position is that Shabana et al teach that “*hydrogen would be drawn simultaneously from all three storage tanks and not just one of the storage tanks for maintenance purposes as recited in claim 1*”, the examiner merely points out that the present claim language neither specifically calls for nor positively sets forth that both of the main hydrogen storage site and the auxiliary hydrogen storage site cannot deliver hydrogen simultaneously. Simply put, the examiner is of the view that if hydrogen is simultaneously drawn from all three storage tanks, then, any one of the three hydrogen storage sites contains/provides the hydrogen portion (part) for power generation and any of the other two remaining hydrogen storage sites is capable of containing/providing the hydrogen portion (part) to operate in a hydrated condition. Succinctly stated, it is the examiner’s position, upon reading the claim language of independent claims 1 and 7, that the function or step of powering the load and the scheduled basis to maintain hydrated conditions can take place at the same time or simultaneously because the present claim language does not positively require that powering the load occurs at a different time or moment than maintaining hydrated conditions, or vice-versa. Stated some differently, Claims 1 and 7 do not require either: a) powering the load when not hydrating the polymer membrane, or vice versa, b) hydrating the polymer membrane when not powering the load. Claims 1 and 7 only recite that “*to maintain the polymer membrane in the hydrated condition without utilization of the hydrogen from the main hydrogen storage site*”.

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That is, the polymer membrane can be maintained in the hydrated condition, while generating power, as long as no hydrogen from the main hydrogen storage site is utilized for the purposes.

On the other hand, if applicant is of the opinion that "*Shabana et al. discloses a hydrogen processing unit 30 which is configured to selectively receive hydrogen gas either a compressed gas source, a liquid hydrogen source or a solid source, but not all at once*". Then, the examiner contends that selectively supplying hydrogen from either one of the hydrogen gas source at different times or moments (i.e. "*but not all at once*") provides the necessary functional and structural interrelationship to satisfy the claimed requirement of independently supplying hydrogen for power generation from a first hydrogen source, and subsequently, supplying hydrogen for maintaining the hydrated condition from another hydrogen source regardless of whether or not the another hydrogen source also generates power. In other words, a first hydrogen source is construed as providing hydrogen for power generation per se while another (a second) hydrogen source is construed as supplying hydrogen for maintaining hydrated conditions per se although the another (second) hydrogen source may also be providing hydrogen for power generation.

10. In response to applicant's argument that "*the auxiliary hydrogen storage site can be renewed independently of the main hydrogen storage site*", it is first asserted that applicant has admitted that the cited references does teach three separate-independent-stand alone hydrogen tanks. Therefore, the examiner avers that as long as these three hydrogen storage tanks are separate-independent-stand alone tanks, any of the tanks can be renewed independently from the other. There is no evidence of record, either in the cited reference or by submission of an applicant's declaration, to show that these hydrogen tanks cannot be replaced and/or if they are

removed the fluid connecting line would be catastrophically damaged or broken. Indeed, paragraph 0024 of Shabana et al offer specific guidance to support hydrogen source renewal as it states that “*the originally installed hydrogen storage media may be removed from the vehicle and replaced by a different type of hydrogen storage media*”. Thus, Shabana et al readily envisions independent replacement of hydrogen storage sources.

11. In response to applicant's arguments, the recitation “*to operate on a scheduled basis when not powering the load*” has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

12. Lastly, applicant's arguments concerning the limitation “*a flow control network*” has been fully considered. However, such a limitation adds nothing to the patentability of the present claims simply because it lacks specific structural characteristics or features to fairly distinguish over the “*fluid distribution line (network)*” of the prior art. A flow control network is being broadly interpreted as a simple distribution line for feeding/distribution or delivering flow. Nothing more, nothing less. If applicant wants to afford it a different interpretation, such as including additional components, members and/or structures, applicant must do so by amending the claims to recite such components, members and/or structures. Otherwise, arguing the presence of un-recited limitations or components just renders applicant's argument not commensurate in scope with the present claim language.

***Conclusion***

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro  
Primary Examiner  
Art Unit 1745

  
RAYMOND ALEJANDRO  
PRIMARY EXAMINER